Space Weather Forecast

Issued on Tuesday, 27 December 2022 at 01:30 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Risk of Minor geomagnetic storms throughout, mainly on 27 and 29 December. Slight chance of M-class flares.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Low with six sunspot regions on the visible disc. The two large regions in the northwest quadrant appear to be simplifying, with the greatest flare risk from a developing region close to the northeast limb. The remaining regions appear to be weak and relatively simple. Two CMEs (coronal mass ejections) have been analysed in the last 24 hours, one from the southeast quadrant late on 25 December which appears to be directed away from Earth. A further eruption in the northwest quadrant during 26 December is currently being modelled with a risk of an Earth-directed component.

Solar Wind / Geomagnetic Activity: Solar wind speeds have been very steadily declining, but have been mainly elevated throughout. There was a spike to strong levels early on 26 December which appears to be due to a glancing blow from a CME which left the Sun early on 24 December. Total magnetic field strength was mainly moderate and peak during the possible CME passage, but has since declined. The north-south component of the magnetic field was moderately negative for around six hours, following the possible CME. Geomagnetic activity started Quiet to Unsettled, but became Active, then reached Minor storm levels during the middle of the period, before declining to Quiet levels.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is forecast to be at mainly Low levels, but with an increasing risk of moderate activity from sunspots on, or rotating onto the eastern limb.

Solar Wind / Geomagnetic Activity: A CME which left the Sun early 24 December may have affected Earth on 26 December. Two further CMEs may affect the Earth over the next four days. The first, from an eruption on the 24 December, may arrive on 27 December, with one from the 25 December arriving on 29 December.

A fast solar wind which was expected to affect the Earth from 26 December may not affect the Earth, or any effects of this wind may have been masked by the probable CME arrival. A further fast wind is forecast to connect to Earth on 29 December with elevated speeds likely. Geomagnetic activity is forecast to be mainly Unsettled on 27 December, with a risk of Active to G1/Minor Storm intervals. Generally Quiet to Unsettled on 28 December, but with a risk of elevated geomagnetic activity due to a possible early connection to fast solar wind, with this considered more likely on 29 December, where there is a chance of Active to G1/Minor Storms. The forecast is currently uncertain for 30 December, with a recent fast CME which left the Sun late on 26 December from the northwest quadrant potentially being added to the forecast once analysis is complete.

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Energetic Particles / Solar Radiation: There is a daily slight chance of reaching S1 levels, largely as a result of the largest sunspot's westward progression.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	YES	50	20	30	20
Strong	G3	No	5	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	40	40	40
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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